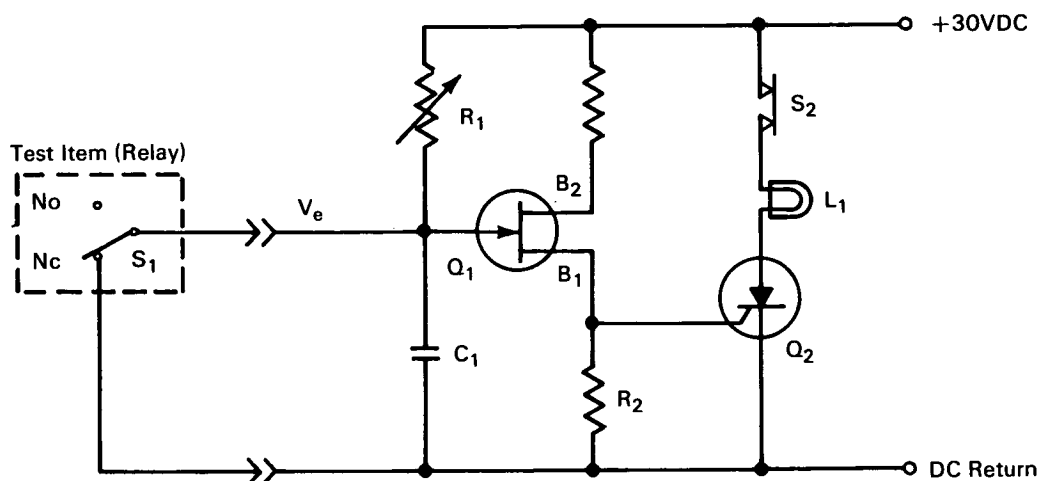


NASA TECH BRIEF



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Solid State Detectors Monitor Relay Contacts



The problem:

To constantly monitor contact conditions in relays. Previous devices used a capacitor charge to fire a thyratron tube that triggered an indicator of some sort to show a change in contact condition. The thyratron circuit and its associated vacuum tube power supply are sensitive to external noise and power supply variations and are very difficult to calibrate. Additionally, this type detector, in multichannel applications is of standard rack size and considerable weight.

The solution:

A hand carried, solid state, 18-channel detector system that is relatively insensitive to external noise and is powered by standard 110 volt ac.

How it's done:

The normally closed contacts, S_1 , of the test item maintain a short across C_1 so long as they remain closed. If the contacts open, C_1 will charge from the 30-vdc source at a rate determined by the time constant R_1, C_1 . If the contacts remain open for a predetermined period ($10 \mu\text{sec}$ for this circuit), the voltage V_e at the emitter of Q_1 rises and causes Q_1 to conduct. C_1 discharges through the emitter and base 1 of Q_1 and develops a voltage pulse across R_2 thus triggering Q_2 into conduction and lighting the Fail Indicator lamp, L_1 . Q_2 will remain in conduction and L_1 will remain lit until power to Q_2 is interrupted by the manual opening of the Indicator Reset switch S_2 .

(continued overleaf)

Notes:

1. Calibration is accomplished using an oscilloscope across R_2 . The contacts of S_1 are manually opened, causing the Q_1 circuit to oscillate. By varying potentiometer R_1 , the circuit time constant can be adjusted so that the free-running period of oscillation is slightly less than $10 \mu\text{sec}$. This compensates for the initial pulse being slightly longer than the period in steady-state oscillation.
2. This 18-channel system has been successfully used in vibration and acceleration tests of Ranger and Mariner components where relay contact behavior is of significant interest.

3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, California 91103
Reference: B66-10396

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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(JPL-785)